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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN R. KOZA, FORREST H. BENNETT III, and
OSCAR STIFFELMAN

Appeal 2012-003934
Application 09/548,637
Technology Center 2100

Before DENISE M. POTHIER, JEFFREY S. SMITH, and
JEREMY J. CURCURI, *Administrative Patent Judges*.

CURCURI, *Administrative Patent Judge*.

DECISION ON APPEAL

SUMMARY

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-6, 13, and 15-23 under 35 U.S.C. § 103(a) as obvious over Appellants' Admitted Prior Art (AAPA)[1], in view of Koza (US 5,867,397) and Beasley (*An Overview of Genetic Algorithms*: *Part 2, Research Topics* 1-15[2]).

We reverse.

STATEMENT OF CASE

Appellants' invention relates to "[using] a population of entities which may be evolved to generate structures that may potentially satisfy the design goals. The behavior of the structures is evaluated in view of the design goals, and the structures are compared to a preexisting structure. Those structures more closely meeting the design goals and not similar to the preexisting structure are favored further until a structure is generated that either meets the prespecified design goal or some other process completion criteria." (Abstract). Claim 1 is illustrative and reproduced below with the key disputed limitation emphasized:

1. A computer-implemented process for creating an entity that satisfies a predetermined design requirement that at least one characteristic is not in a reference structure, the process comprising:

initializing a plurality of candidate entities and an iteration count with a predetermined value by *supplying, from an external source, at least one candidate entity partially satisfying the predetermined design requirement*

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[1] The Examiner makes reference to pages 6 (Koza), 8-10 (Koza), and 94 (Ullman) in the disclosure as AAPA. Ans. 5-9, 26-29.

[2] Fifteen pages were provided for this reference, and we make reference to those consecutive pages in this opinion.

which includes a characteristic of the reference structure to the initialized plurality of candidate entities, wherein each candidate entity is represented by a tree structure having a plurality of nodes representing a structure of the candidate entity;

performing iterative genetic programming operations, each iteration including:

creating a description of the structure for each of the candidate entities based on its tree structure,

analyzing behavior and characteristics based on the description of the structure of each candidate entity, including a simulation of the structure,

comparing each of the plurality of candidate entities with the reference structure based on the analysis of the behavior and characteristics to obtain an isomorphism value for each candidate entity, the isomorphism value representing a dissimilarity between the respective candidate entity and the reference structure,

determining a fitness value for each of the candidate entities based on a compliance with the predetermined design requirement and the isomorphism value of the respective candidate entity,

selecting at least one candidate entity from the plurality of candidate entities that has a fitness value exceeds a predetermined threshold,

creating at least one new candidate entity by creating a variation in the selected at least one candidate entity if the selected at least one candidate does not satisfy the predetermined design requirement or a number of iterations has not reached the predetermined value of the iteration count, including performing one of a reproduction operation, offspring crossover operation, mutation operation, and an architecture altering operation on the at least one selected candidate entity, and

terminating the iterations if the selected at least one candidate satisfies the predetermined design requirement or a number of iterations has reached the predetermined value of the iteration count, wherein at least one of the selected candidate entities is used to design an end-result structure in

view of the predetermined design requirement, wherein the end-result structure does not possess key characteristics of the reference structure; and

updating the iteration count at the end of each iteration.

CONTENTIONS

The Examiner finds that AAPA, Koza, and Beasley collectively teach all recited limitations of claim 1, including "initializing a plurality of candidate entities . . . by supplying, from an external source, at least one candidate entity partially satisfying the predetermined design requirement which includes a characteristic of the reference structure to the initialized plurality of candidate entities[.]" The Examiner maps this limitation to expert initialization of designs. (Ans. 5-6, 11, 12, and 16-20 (citing AAPA page 8, ll. 9-10; Beasley, section 13, p. 10)).

Among other arguments, Appellants argue that "[t]he cited section of the alleged [AAPA] fails to disclose or suggest initializing candidate entities in which at least one candidate entity partially satisfies the predetermined design requirement *which includes a characteristic of the reference structure,*" and that "[t]here is no suggestion in the alleged [AAPA] *to include characteristics of the reference structure* during initialization." (Br. 11 (emphases added)). Appellants also argue that:

> Although Beasley discloses an introduction of genetic algorithms, Beasley fails to disclose the specific limitations of genetic programming techniques set forth in independent claim 1. Independent claim 1 is not merely about genetic algorithms or genetic programming. Rather, independent claim 1 is about a specific way to design structures using genetic programming techniques.

(Br. 14).

ISSUE

Under 35 U.S.C. § 103, has the Examiner erred by finding that AAPA and Beasley teach "initializing a plurality of candidate entities . . . by supplying, from an external source, at least one candidate entity partially satisfying the predetermined design requirement which includes a characteristic of the reference structure to the initialized plurality of candidate entities" as recited in claim 1?

ANALYSIS

On this record, we find error in the Examiner's obviousness rejection of independent claim 1.

The Examiner cites, as teaching expert initialization, AAPA's discussion of the architecture for a computer program that is to be evolved using genetic programming. The Examiner cites AAPA page 8, lines 9-10 and states "the cited section of [the AAPA] disclose[s] human (expert) pre-specifying candidate entities; therefore disclose[s] and suggest[s] expert initialization." (Ans. 18). But even assuming, without deciding, that the AAPA teaches expert initialization, the Examiner does not explain how the AAPA describes the recited candidate entity's *characteristic of the reference structure.*

The Examiner also cites, as teaching expert initialization, Beasley's heuristic initialization of the population of candidate entities. The Examiner cites Beasley, section 13, and states:

> Beasley also disclosed domain knowledge can also be used to design local improvement operators which allow more efficient exploration of the search space around good points. It can also be used to perform heuristic *initialization* of the

> population so that search begins with some *reasonably good points* rather than a random set. [T]hose good points (designs) are points "partially satisfying" some design requirement (characteristic).

(Ans. 17). The Examiner does not explain how Beasley describes the recited candidate entity's *characteristic of the reference structure.* On this record, we do not see any reason why the "reasonably good points" of Beasley would necessarily be candidate entities meeting the recited claim limitations, as opposed to some other initialization points.

Even if we assume that AAPA and Beasley teach expert initialization, because the Examiner does not clearly explain why AAPA or Beasley meets the argued limitations relating to the candidate entities satisfying the recited predetermined design requirement of claim 1, we are persuaded that the Examiner has erred in rejecting claim 1.

Additionally, when broadly construing the phrase, "a characteristic of the reference structure" as recited in the argued limitation relating to the candidate entities, Beasley's "reasonably good points" could arguably be considered to relate to a characteristic of *some* reference structure in order to obtain the good points. Yet, the "reference structure" in the claim is also recited during the "comparing" step. Any interpretation of the term "reference structure" must be consistent with and reasonable in light of all claim limitations. We are not persuaded that the Examiner has demonstrated that AAPA, Beasley, and Koza teach the additional argued limitations consistent with the initialization step recitation that requires supplying a candidate entity partially satisfying a predetermined design requirement which includes a characteristic of the reference structure.

For the foregoing reasons, Appellants have persuaded us of error in the rejection of: (1) independent claim 1; (2) independent claims 22 and 23 which recite commensurate limitations; and (3) dependent claims 2-6, 13, and 15-21 for similar reasons.

DECISION

The Examiner's decision rejecting claims 1-6, 13, and 15-23 is reversed.

REVERSED

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